MINISTERE DE L'EQUIPEMENT,
DES TRANSPORTS ET DU LOGEMENT

DIRECTION GENERALE DE L'AVIATION CIVILE

SERVICE
DE LA FORMATION AERONAUTIQUE
ET DU CONTROLE TECHNIQUE

DIVISION AERONEFS

BUREAU NAVIGABILITE DES MOTEURS ET EQUIPEMENTS

ISSY-LES-MOULINEAUX, LE 11 MARS 1999



53165

N/REF: 990784 SFACT/NME
V/REF:

FAA
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Washington DC 20591
USA
Attn.: RULES DOCKET, DOCKET N° FM-1998481 5

FAA-98-4815-10

Affaire suivie par: FAGEGALTIER Francis

**Objet: Commentaires NPRM 98-I 9.**

Monsieur,

j'ai l'honneur de vous faire parvenir en annexe les commentaires sur la NPRM 98-19 "bird ingestion" du Bureau "certification des moteurs" de la DGAC.

Je vous prie **d'agréer,** Monsieur, mes meilleures salutations.

SERVICE
DE LA FORMATION AERONAUTIQUE
ET DU CONTROLE TECHNIQUE

INFORMAL TRANSLATION

Sir

I am pleased to give you, attached, the comments on the NPRM 98-19 “bird ingestion” from the DGAC “Engine certification” office.

With my best regards

## Comments on FAA NPRM n° 98-19 Bird ingestion

### Comment on the preamble part of the NPRM

We regret that the JAA position was not exactly understood. It appears that the FAA's response, as shown in the preamble of the NPRM, is not addressing JAA's proposal but something else. For example, the following text, copied from the preamble, is , clear enough by itself for illustrating this misunderstanding :*"The additional 4 lb. bird* consideration proposed by *JAA is intended to do no more than to provide some assurance of parity with current in-service fan designs, it is not intended to ensure a full run-on capability after the ingestion of a 4 lb. bird. The FAA disagrees. The JAA position statement contains two major concerns: (1) That flocking birds larger than 2.5 lb. are a significant enough threat to require an evaluation for run-on capability"* . [ underlined are the contradictory statements ]

A better statement of the JAA objective would be :

> The additional 4 lb. bird consideration proposed by JAA is intended to do no more than to provide some assurance of parity with current in-service fan designs, hence ensuring some run-on capability after the ingestion of a 4 lb. bird. Therefore, engines certificated under the new rules would demonstrate equivalent robustness to the previous engines which provided the basis for the service experience.

JAA agreed with the arguments which were presented for justifying the new rules. However, we disagree with the following statement *: Therefore, it is the intent of this proposed rule to strengthen the engine airworthiness requirements by increasing the medium bird ingestion requirements from 7.5 to 2.5 lb. birds (representing the herring gull threat) and, by increasing the single large bird ingesfion requirements, to address bird threats from* 4 to 8 *lb.* (Canada goose).

There is no increase in severity of the requirements due to the increase of the weight of the large bird, because the pass / fail criteria has not been changed : a safe shut down is still required. As stated in the preamble *("This . . . shutdown rate was attributed to the blade-out containment test requirements of Sec. 33.94 constituting a more severe test relative to safe shutdown criteria for a/most all engines* "), the large bird test could be waived if it is demonstrated that the bird ingestion induces no more damage than the fan blade out test. So if the engine is destroyed, safely, by a 4 lb bird (loosing a full fan blade), it will also be destroyed by a 6 or 8 lb bird and probably as safely. There is no increase in the engine strength if the engine is designed to be at the minimum allowed by the NPRM's proposal.

We disagree with the conclusion of the following statement :*"Review of the revenue service data however showed that medium and large turbofans exposed to single large birds above 4 Ibs. have demonstrated safe shutdown characteristics as defined under Sec. 33.75 even with bird sizes up to 15 Ibs.*

*.... The infenf of this proposed rule is fo establish fhe single large bird size as a function of inlet surface area greater than 2,100 square-inches at a level where fhe exposure to birds beyond that specified in this proposed rule would be in the range of 1 E-6 fo 1 E-7 ingestion per aircraft departure. This coupled with fhe prior service history record of safisfacfory shutdown experience when exposed to very large birds, provides a potential improvement for hazardous consequences to continued safe flight info fhe extremely remote range of probability, i.e., 1E-7 fo 1E-9".*

JAA argued that the in-service engines were statistically able to safely encounter very large 'birds because they were, most of them, above the minimum certification standard. The "*potential improvement*" could not be ensured by the text of the new rule as it is proposed because the pass / fail criteria has not been changed for large birds. However, we would agree that this improvement might exist if the technology remained as it was in the past; but, new technologies are now proposed which demonstrate a different behaviour. Thus, the JAA statement as noted in the preamble *: "The addifional 4 lb. bird consideration proposed by JAA is intended fo do no more than to provide some assurance of parity with current in-service fan designs* ".

For a complete justification of the JAA's position, it is recommended to read the corresponding JAA NPA-E-20 which is being world wide circulated for comments.

**Comments on the proposed FAR 33 rules.**

Of course, the first comment is to add a requirement in order to ensure that future designs will not be less capable than today's engines. JAA have declared that they are ready to listen to proposals from the industry for writing a text which would represent the current capability of in-service engines. It is also agreed that this would only be applied to engines demonstrating for the new 6 or 8 lb large bird a "minimum" capability. The intent being then, for these engines, to demonstrate that for a 4 lb bird they are as capable as today's engines.

The proposed 33.76 (b) and (c) impose a test which is clearly an engine test as evidenced in 33.76 (c)(2). However, it is generally considered as being acceptable to have an exemption to this engine test in some cases, in particular for certifying derivative engines when the fan and low pressure compressor are not changed. The JAA text is allowing this exemption in the rule, when we know that the FAA intends to do that by means of the advisory material : this is contrary to the legal advice provided to the harmonisation groups concerning "rulemaking by AC".

**Comments on the proposed FAR 23 and FAR 25 rules.**

The proposed changes to FAR 23.903 and FAR 25.903 are not understood.

For example, 25.903 (a)(2)(ii) allows non compliance with the new bird rules of 33.76 and allows the use of the "old" bird rules without any compensation. This

would therefore invalidate the efforts made in this harmonisation programme for providing adequate safety levels.

25.903 (a)(2)(iii) and (iv) again allow non compliance with the new rules : this is against all the arguments presented in the preamble justifying the new rule making. The "unsafe" condition referred to in 25.903 (a)(2)(iii) or (iv) is not defined. In light of the fact that the new rules are intended to achieve a IO-8 safety level compared to a $10^{-7}$ level with the old rules, it is considered that no engine design will have amassed sufficient hours to validate the existence of "safe" or "unsafe" conditions.

The rationale presented in this NPRM clearly indicates that an engine which would be designed to comply with the minimum defined in the old certification rules would only provide a 10-7 safety level for the aircraft. This is indicated as not being sufficient and a IO-8 level is said to be the goal. Then, it is not acceptable to certify a new aircraft with engines which would not provide the adequate safety level.

In conclusion, for being consistent with the preamble of the NPRM, because it is a safety issue of a general nature, 23.903 and 25.903 should read as follows

> 25.903 / 23.903 (a)(2) Each turbine engine must comply with Sections 33.76, 33.77 and 33.78 of this chapter in effect on (*effective date of final rule* ) or demonstrate an equivalent safety level.

However, the exact wording for FAR 23 should be checked in light of the fact that most of FAR 23 aircraft are equipped with piston engines to which paragraphs 33.76, 33.77 and 33.78 are not applicable at all or with turboprop engines which are small enough for being certified under new rules which might be considered as less severe for this size of engines.

**General comment**

These proposals should be sent back to the Engine Harmonisation Working Group for review of the comments and for finding, if possible, a solution to the disharmony with the corresponding JAR-E text.